

What is claimed is:

1. An apparatus for coating metal strip with laminate, the metal strip adapted to be fed through the apparatus, comprising:
- a support frame;
  - top and bottom carriages carried by the support frame and movable relative to the support frame towards and away from each other, the top and bottom carriages supporting top and bottom roller coaters, respectively, the carriages being movable towards each other to a close position pinch the metal strip therebetween for application of laminate and away from each other to a spread position facilitate loading of metal strip;
  - at least one top fluid actuator and at least one bottom fluid actuator supported by the support frame and acting on the top and bottom carriages, respectively;
  - a fluid control having a pressurized input, the fluid control being operatively connected to the top and bottom cylinders, the fluid control being operable to selectively move the roller coaters towards or away from each other; and
  - a fluid connection between the top fluid actuator and the bottom fluid actuator, wherein the top and bottom carriages are movable upwardly and downwardly in unison when the top and bottom carriages are in the close position.
2. The apparatus of claim 1 wherein the further comprising at least one return spring opposing the top and bottom fluid actuators biasing the top and bottom carriages to one of the close and spread positions.
3. The apparatus of claim 2 wherein the at least one return spring is connected between the top and bottom carriages in a state of tension, wherein the at least one return spring biases the top and bottom carriages to the close position.
4. The apparatus of claim 3 wherein pressurization of the fluid connection between the top and bottom fluid actuators drives the top and bottom carriages to the spread position.

5. The apparatus of claim 1 wherein the top and bottom fluid actuators comprise a common cylinder housing mounted to the support frame, the top and bottom fluid actuators having top and bottom pistons acting on the top and bottom carriages, respectively, the top and bottom pistons sliding in the common cylinder housing with a common chamber formed between the top and bottom pistons, pressurization of the common chamber driving the top and bottom pistons apart to position the top and bottom carriages in the spread position.

6. The apparatus of claim 5 wherein the fluid control comprises a valve having a first position connecting the common chamber with the pressurized input and a second position connecting the common chamber with an exhaust port.

7. The apparatus of claim 6 wherein the valve further includes a third position disconnecting the common chamber from both of the exhaust port and the pressurized input.

8. The apparatus of claim 1 wherein the top and bottom fluid actuators are supported by the support frame and connected to the top and bottom carriages, respectively, each fluid actuator comprising a housing defining a control chamber and a piston actuator slidably disposed in the control chamber and dividing the control chamber into upper and lower pressure compartments; further comprising  
a first conduit fluidically connecting the upper and lower compartments of the top and bottom fluid actuators, respectively; and  
a second conduit fluidically connecting the lower and upper compartments of the top and bottom fluid actuators, respectively.

9. The apparatus of claim 8 wherein the housings of the top and bottom fluid actuators are affixed to the top and bottom carriages, respectively, and wherein the pistons are affixed to the support frame, whereby the pistons are stationary and the housings are movable.

Sub A11

10. The apparatus of claim 1 wherein, each of the roller coaters includes: an applicator roll contacting the metal strip at a first contact point while in the engaged position for support thereby, the applicator roll adapted to receive and apply laminate, the applicator roll adapted to driven about a predetermined axis of rotation by the metal strip while in the engaged position; and

a pair of supports engaging the applicator roll in the engaged position at second and third contact points, the first, second and third contact points being located at different angular positions about the predetermined axis to carry the applicator roll therebetween.

11. The apparatus of claim 10 wherein the roller coaters are movable apart from each other from the engaged position to a disengaged positions wherein the metal strip is not pinched to facilitate loading of metal strip, the upper roller coater further comprising:

support means for supporting the bottom of the applicator roll and retaining the applicator roll in the upper roller coater.

12. The apparatus of claim 11 wherein the support means is two sets of support arms, each set being spaced apart along the predetermined axis, the arms of each set defining fourth and fifth contact points spaced at an angular spacing about to the predetermined axis for holding the bottom of the roller coater, one arm of each set being movable from the other arm to allow for removal of the applicator roller.

13. The apparatus of claim 12 wherein each roller coater further comprises retaining spring loaded stops engaging the axial ends of the applicator roll for axial retention of the applicator roll.

14. The apparatus of claim 12 wherein the apparatus includes a manifold for supplying laminate to the applicator roll, wherein each roller coater further includes:

at least one applicator head having an inlet connected to the manifold for receiving laminate, a longitudinal outlet, and a recessed surface closely receiving the outer peripheral surface of one of the support rolls, the inlet communicating laminate to the outlet for application of laminate to the support roll, the longitudinal outlet being defined in the

Sub A11

recessed surface and extending substantially across the axial length of the support roll for applying laminate to the support roll, wherein the support roll contacts the applicator roll along a laminate transfer line parallel with the predetermined axis for application of laminate to the applicator roll.

15. The apparatus of claim 14, further comprising:

a control valve having a pressurized input of laminate and at least two different positions corresponding to different output flows;

a manifold connecting the output flow of the control valve to the at least one head;

and

means for modulating the valve between the at least two different positions to set an application rate of the controlled amount of laminate, the modulating means being controllable to change the application rate.

16. An apparatus for coating metal strip with laminate, the metal strip adapted to be fed through the apparatus, comprising:

a support frame;

top and bottom carriages carried by the support frame and movable relative to the support frame towards and away from each other, the top and bottom carriages supporting top and bottom roller coaters, respectively, the carriages being movable towards each other to a close position pinch the metal strip therebetween for application of laminate and away from each other to a spread position facilitate loading of metal strip;

a pair of top fluid actuators supported by the support frame on opposite sides of the top carriage and acting on the top carriage;

a pair of bottom fluid actuators supported by the support frame of opposite sides of the bottom carriage and acting bottom carriage; and

a fluid control having a pressurized input, the fluid control being operatively connected to the to top and bottom cylinders, the fluid control being operable to pressurize the top fluid actuators and the bottom fluid actuators driving the top and bottom roller coaters toward the spread position;

a fluid connection between the top fluid actuator and the bottom fluid actuator,

Sub A11

wherein the top and bottom carriages are movable upwardly and downwardly in unison when the top and bottom carriages are in the close position; and

return springs on opposite sides of the top and bottom carriages biasing the top and bottom carriages to the close position.

17. The apparatus of claim 16 wherein the return springs are connected between the top and bottom fluid actuators in a state of tension, wherein the return springs biases the top and bottom carriages to the close position.

18. The apparatus of claim 16 wherein pairs of one of the top fluid actuators and one of the bottom fluid actuators comprise a common cylinder housing mounted to the support frame, the top and bottom fluid actuators having top and bottom pistons acting on the top and bottom carriages, respectively, the top and bottom pistons sliding in the common cylinder housing with a common chamber formed between the top and bottom pistons, pressurization of the common chamber driving the top and bottom pistons apart to position the top and bottom carriages in the spread position.

19. The apparatus of claim 18 wherein the fluid control comprises a valve having a first position connecting the common chamber with the pressurized input and a second position connecting the common chamber with an exhaust port.

20. The apparatus of claim 19 wherein the valve further includes a third position disconnecting the common chamber from both of the exhaust port and the pressurized input.

21. An apparatus for coating metal strip with laminate, the metal strip adapted to be fed through the apparatus, comprising:

a support frame;

top and bottom roller coaters carried on the support frame, adapted to pinch the metal strip therebetween in an engaged position, each of the roller coaters including:

Sub A11

an applicator roll contacting the metal strip at a first contact point while in the engaged position, the applicator roll adapted to receive and apply laminate, the applicator roll adapted to driven about a predetermined axis of rotation by the metal strip while in the engaged position; and

a pair of discrete supports engaging the applicator roll in the engaged position at second and third contact points, the first, second and third contact points being located at different angular positions about the predetermined axis such that the applicator roll is carried without journalling of the applicator roll in bearings.

22. The apparatus of claim 21 wherein the roller coaters are movable apart from each other from the engaged position to a disengaged positions wherein the metal strip is not pinched to facilitate loading of metal strip, the upper roller coater further comprising: support means for supporting the bottom of the applicator roll and retaining the applicator roll in the upper roller coater.

23. The apparatus of claim 21 wherein the applicator roll is not physically connected to any part of the apparatus.

24. The apparatus of claim 21 wherein the apparatus includes a manifold for supplying laminate to each of the applicator rolls, wherein each roller coater further includes:

at least one applicator head having an inlet connected to the manifold for receiving laminate, an outlet, and a recessed surface closely receiving the outer peripheral surface of the applicator roll, the inlet communicating laminate to the outlet for application of laminate to the applicator roll, the outlet being defined in the recessed surface and extending substantially across at least a portion of the applicator roll for applying laminate to the applicator roll.

25. The apparatus of claim 24 wherein the at least one applicator head is movable relative to the frame, further comprising a spring mechanism biasing the recess of the applicator head against the applicator roll.

26. The apparatus of claim 24, further comprising:  
a control valve having a pressurized input of laminate and at least two different positions corresponding to different output flows;  
a manifold connecting the output flow of the control valve to the at least one head;  
and  
means for modulating the valve between the at least two different positions to set an application rate of the controlled amount of laminate, the modulating means being controllable to change the application rate.
27. The apparatus of claim 24 wherein the applicator head of the top roller coater includes support means for supporting the bottom of the applicator roll and retaining the applicator roll against the action of gravity.
28. The apparatus of claim 24 further comprising a contact roll mounted to the at least one applicator head engaging the applicator roll to position the applicator roll in the recess of the at least one applicator head.
29. The apparatus of claim 24 wherein the at least one applicator head comprises a plurality of applicators heads across the applicator roll, each applicator head applying laminate to a different section of the applicator roll.
30. The apparatus of claim 24 wherein the applicator roll comprises a rubber material outer coating adapted to receive laminate from the at least one applicator head and carry laminate to the metal strip.
31. The apparatus of claim 21 wherein the discrete supports are provided by first and second support rolls.
32. The apparatus of claim 31 wherein sets of said first and second support rolls are provided at opposing ends of the applicator roll, the first and second support rolls

Sub A1

being received in cylindrical recess at opposing ends of the applicator roll.

33. The apparatus of claim 21 wherein the laminate is a lubrication suitable for lubrication of a press machine, the apparatus being situated upstream of the press machine lubricating the metal strip prior to reaching the press machine.

34. An apparatus for coating metal strip with laminate, the metal strip adapted to be fed through the apparatus, comprising:

a support frame;

at least one roller coater carried on the support frame, adapted to engage the metal strip in an engaged position, the roller coater including:

an applicator roll contacting the metal strip at a first contact point while in the engaged position, the applicator roll adapted to receive and apply laminate, the applicator roll adapted to driven about a predetermined axis of rotation by the metal strip while in the engaged position; and

a pair of discrete supports engaging the applicator roll in the engaged position at second and third contact points, the first, second and third contact points being located at different angular positions about the predetermined axis such that the applicator roll is carried without journalling of the applicator roll in bearings.

35. The apparatus of claim 34 wherein the applicator roll is not physically connected to any part of the apparatus.

36. The apparatus of claim 34 wherein the apparatus includes a manifold for supplying laminate to the applicator roll, wherein the at least one roller coater further includes:

at least one applicator head having an inlet connected to the manifold for receiving laminate, an outlet, and a recessed surface closely receiving the outer peripheral surface of the applicator roll, the inlet communicating laminate to the outlet for application of laminate to the applicator roll, the outlet being defined in the recessed surface and extending substantially across at least a portion of the applicator roll for applying laminate to the

506A11



applicator roll.

37. The apparatus of claim 36 wherein the at least one applicator head is movable relative to the frame, further comprising a spring mechanism biasing the recess of the applicator head against the applicator roll.

38. The apparatus of claim 36, further comprising:  
a control valve having a pressurized input of laminate and at least two different positions corresponding to different output flows;  
a manifold connecting the output flow of the control valve to the at least one head;  
and  
means for modulating the valve between the at least two different positions to set an application rate of the controlled amount of laminate, the modulating means being controllable to change the application rate.

39. The apparatus of claim 36 wherein the applicator head includes support means for supporting the bottom of the applicator roll and retaining the applicator roll against the action of gravity.

40. The apparatus of claim 36 further comprising a contact roll mounted to the at least one applicator head engaging the applicator roll to position the applicator roll in the recess of the at least one applicator head.

41. The apparatus of claim 36 wherein the at least one applicator head comprises a plurality of applicators heads across the applicator roll, each applicator head applying laminate to a different section of the applicator roll.

42. The apparatus of claim 36 wherein the applicator roll comprises a rubber material outer coating adapted to receive laminate from the at least one applicator head and carry laminate to the metal strip.

Sub A11

43. The apparatus of claim 34 wherein the discrete supports are provided by first and second support rolls.

44. The apparatus of claim 43 wherein sets of said first and second support rolls are provided at opposing ends of the applicator roll, the first and second support rolls being received in cylindrical recess at opposing ends of the applicator roll.

45. The apparatus of claim 43 wherein the laminate is a lubrication suitable for lubrication of a press machine, the apparatus being situated upstream of the press machine lubricating the metal strip prior to reaching the press machine.

Sub A1

any other form of support roll may be used in place of the first and second support rolls.

Sub A2